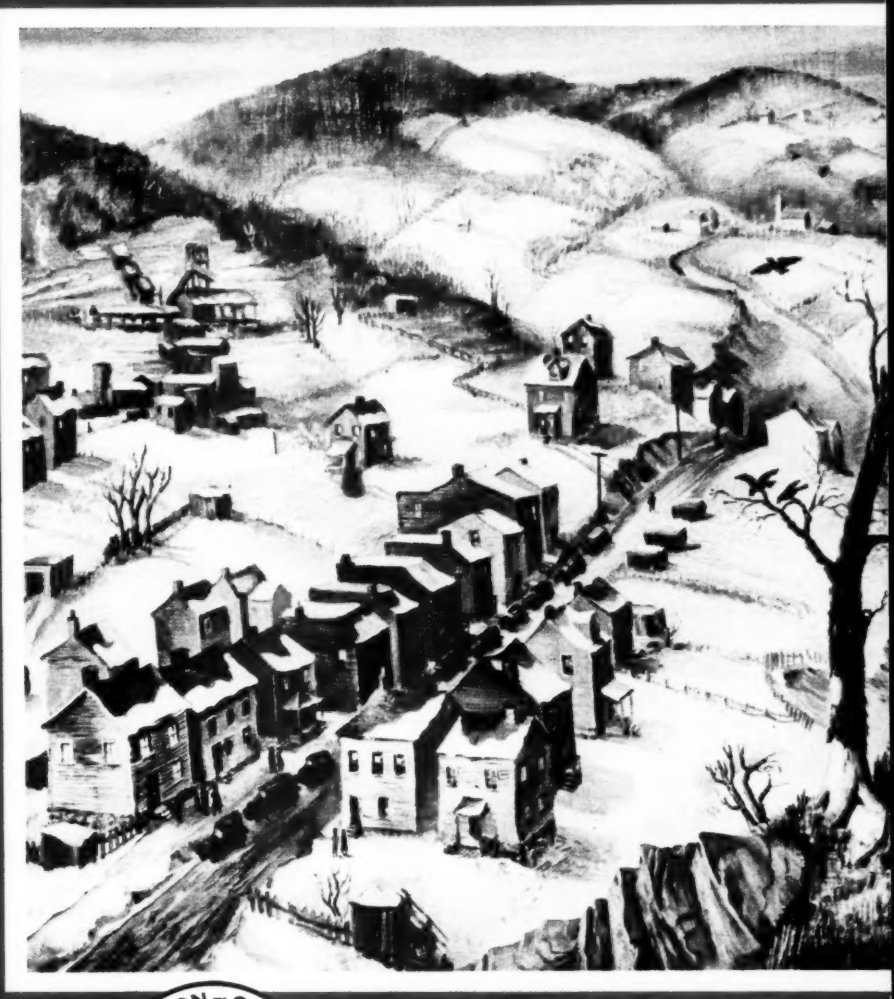
GeoTimes

Professional News Magazine



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April 1959
Vol. III, No. 7
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Calendar

Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.

April 5-10, 1959—AMER. CHEM. SOC., 135th Ann. Mtg., Boston, Mass.

April 13-14, 1959—LAKE SUPERIOR INSTITUTE ON GEOLOGY, University of Minnesota, Minneapolis, Minn.

April 13-15, 1959—CIMM: Ann. Gen. Mtg., Queen Elizabeth Hotel, Montreal, Quebec.

April 13-15, 1959—ASSOCIATION OF AMERICAN STATE GEOLOGISTS, Lawrence, Kansas.

April 16, 1959—OHIO ACAD. OF SCIENCE, Capital University, Columbus, Ohio.

April 16-18, 1959—GSA: Southeastern Section, Chapel Hill, N. C.

*April 16-18, 1959—SEPM: Permian Basin Sect., Ann. Mtg. and field trip, Desert Aire Motel, Alamagordo, New Mexico. Write: Richard F. Meyer, Box 1287, Roswell, N. M.

*April 20-22, 1959—3rd SYMPOSIUM ON ROCK MECHANICS, sponsored by min. engrg. depts. of Colo. School of Mines, Univ. of Minnesota & Penn State Univ. at Golden, Colo.

April 27-28, 1959—SEGp: 12th Ann. Midwestern Meeting, Cortez Hotel, El Paso, Texas.

April 27-30, 1959—INTERNATIONAL SYMPOSIUM on Physical Chemistry of Extractive Metallurgy, Penn-Sheraton Hotel, Pittsburgh.

May 4-7, 1959—AGU: Annual Meeting, Washington, D. C.

May 7-8, 1959—AIME: SOC. PETR. ENG., Permian Basin Sect. Oil Recovery Conf., Midland, Tex.

May 8-10, 1959—AIME: Uranium Local Sect., Moab, Utah. 4th Ann. Uranium Symposium.

*May 14-16, 1959—GSA, Rocky Mountain Section, Montana State University campus, Missoula, Montana. 3 field trips of Idaho batholith, pre-Cambrian strat. & Glacial Lake areas in vicinity of Missoula. Write: Wehrenberg at Univ. Guidebook.

May 14-23, 1959—INTERNATIONAL PETROLEUM EXPOSITION, Tulsa, Okla. For reservations write: IPE Housing Bureau, Oil Capital Bldg., Tulsa, Okla.

May 30-June 6, 1959—5th WORLD PETROLEUM CONGRESS, Permanent Council, New York. Write: C. E. Davis, Gen. Sec'y. 527 Madison Ave., New York 22.

June 11-12, 1959—IUCr. Commission on Crystallographic Apparatus, two conferences at Karolinska Institutet, Stockholm, Sweden. Inquire: Dr. William Parrish, Philips Laboratories, Irvington-on-Hudson, New York

June 15-17, 1959—SECOND SYMPOSIUM on X-Ray Microscopy & X-Ray Microanalysis, Stockholm. Inquire: Dr. G. Hoglund, Inst. f. Medicinsk Fysik, Karolinska Inst., Stockholm 60, Sweden.

Aug. 24-30, 1959—5th CONGRESS OF THE INTERNATIONAL COMMISSION OF OPTICS, Stockholm, Sweden.

Aug. 30 - Sept. 12, 1959 — INTERNATIONAL OCEANOGRAPHIC CONGRESS, AAAS, UNESCO & ICSU special committee on oceanic research cooperating; United Nations Bldg., N.Y. Write: Dr. Mary Sears, Woods Hole Oceanographic Institution, Woods Hole, Mass.

Oct. 4-7, 1959—AIME: Soc. Petr. Engrs., Fall Mtg., Dallas, Texas.

Oct. 8-10, 1959—AAPG: SW Fed. of Geol. Soc's., 2nd Ann. mtg., Lubbock, Texas.

October 8-10, 1959—OPTICAL SOC. OF AMERICA, Ann. Mtg., Chateau Laurier, Ottawa, Canada.

Oct. 22-23, 1959—AIME: Los Angeles Basin Sect., Fall Mtg., Huntington Sheraton Hotel, Pasadena, Calif.

Oct. 27-29, 1959—AIME: Joint Solid Fuels Conf., Netherlands Plaza Hotel, Cincinnati, Ohio.

Oct. 28-30, 1959—AAPG: Mid-Continent Regional Mtg., Broadview Hotel, Wichita, Kansas.

*Oct. 31-Nov. 7, 1959—GSA: Ann. Mtg., with Pittsburgh Geol. Soc., Pittsburgh, Pa. Two 3-day trips of Valley and Ridge and Appalachian Plateau; two 1-day trips of SW Penn. and central Penn. Write: Buckwalter, Univ. of Pgh., Pittsburgh. Guidebooks.

Nov. 9-12, 1959—SEGp: Ann. Mtg., Biltmore Hotel, Los Angeles, Calif. Jointly with Pacific Section of AAPG on Nov. 12.

Nov. 12-13, 1959—AAPG: PACIFIC SECT., Biltmore Hotel, Los Angeles, Calif. Jointly with SEGp on Nov. 12.

Dec. 12-13, 1959—OKLAHOMA ACAD. OF SCIENCE, Earth Science Sect., Ann. Mtg., Weatherford, Okla.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19th INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

*Aug. 15 - 25, 1960 — XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

1959 SCHEDULE OF FIELD TRIPS

For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.

April 11—ILLINOIS STATE GEOL. SURV., trip to Metropolis area of Massac & Pope Counties, Illinois.

April 12—LAKE SUPERIOR INSTITUTE ON GEOLOGY Field Trip to igneous and metamorphic rocks of Minnesota Valley. Write: J. C. Craddock, Dept. of Geol. & Mineral., Univ. of Minnesota. Guidebook.

April 18—OHIO ACADEMY OF SCIENCE, Ann. Mtg., Capitol Univ., Columbus, Ohio. Trip of Devonian & Mississippian in Columbus area.

April 24-25—SEPM: Pacific Section, Annual Spring Field Trip, Boulder Creek area, Santa Cruz Mountains, Calif. Write: A. A. Almgren, P. O. Box 1031, Bakersfield, Calif.

April 25—ILLINOIS STATE ACAD. OF SCIENCE, Field Trip.

April 30-May 2—FORT SMITH GEOL. SOC., Field trip to pre-Atoka & post Morrow of NW Arkansas. Write: Shields, Box 1037, Fort Smith. Guidebook.

May 2—HOUSTON GEOL. SOC. & SEPM, field trip of Lower Tertiary and Upper Cretaceous of Brazos River Valley, continuation of Dec. 6, 1958 trip. Write: HGS., 234 Esperson Bldg., Houston. Guidebook.

May 2—ILLINOIS STATE GEOL. SURV., trip to Hardin area of Calhoun Co., Illinois.

May 7-9—MISSISSIPPI GEOL. SOC., field trip to study Upper Cretaceous outcrops of NE Miss. & NW Ala.; write MGS, Box 2253, Jackson, Miss. Guidebook.

May 8-9—NEW YORK STATE GEOL. ASSOC., trip to Mid Devonian of central New York. Write: Cole, Cornell Univ., Ithaca. Guidebook.

May 8-9—CORPUS CHRISTI GEOL. SOC., field trip to Miocene through Edwards fm. of SW Texas. Write: Box 1068, Corpus Christi.

May 8-9—KENTUCKY GEOL. SOC., Annual Spring field trip, Nelson and adjoining co's, Ky.

(Continued on page 21)

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This Month in GEOTIMES

Professional News Magazine

Published by THE AMERICAN GEOLOGICAL INSTITUTE

Robert C. Stephenson, EDITOR

Kathryn Lohman, CIRCULATION MANAGER

Vol. III, No. 7 April, 1959

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MINERALOGY: An Introduction to the Study of Minerals and Crystals

By EDWARD H. KRAUS, WALTER F. HUNT, and L. S. RAMSDELL, University of Michigan, New Fifth Edition. Ready in April.

Here is a well-known college text used in geology departments and for reference by practicing geologists. It has always been popular for its extensive use of halftone cuts of crystal models to supplement the conventional line drawings of crystals which many students have difficulty in visualizing correctly. Photographs and short biographical sketches of distinguished mineralogists are another feature of this book.

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By C. B. OFFICER, Rice Institute. *McGraw-Hill International Series in the Earth Sciences.* 284 pages, $10.00

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By W. A. HEISKANEN, Ohio State University; and F. A. VENING MEINESZ, University of Utrecht. *McGraw-Hill International Series in the Earth Sciences.* 470 pages, $12.50.

An advanced volume of great value to graduate students in geology, geophysics and related fields. It presents new conclusions of the earth's tendency towards equilibrium, and of the character and size of deviations from this equilibrium. The approach is entirely new, with the material based mainly on the authors' studies. Recent advances covered include the global significance of the pendulum apparatus of Vening Meinesz for gravity observations at sea.

INTRODUCTION TO GEOPHYSICS

By BENJAMIN F. HOWELL, JR., The Pennsylvania State University. *McGraw-Hill International Series in the Earth Sciences.* 399 pages, $9.00.

A beginning college textbook on the physics of the earth. The principal objectives are to familiarize the reader with the scope of geophysics in relation to the other sciences, to give him some insight into the methods used by geophysicists to study the earth, and to outline some of the most important discoveries of these researches. All major developments in the field reported before 1957 are covered.

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G. E. O.

Engineers and scientists are now concerned with the dollars required to get a given pay load into orbit, or to put a certain pay load on the moon. The cost of putting earth objects into space is still astronomical, but, with the tremendous resources of scientific and engineering energy being put into the problem, the costs are steadily falling. The importance which has been attached to the conquest of space has permitted the application of large amounts of time, energy and money to the solution of the attendant problems. Into the space problems is going not only a large amount of applied research, but also a large measure of basic research—the seeking of new knowledge. The whole frontier of space is providing a challenge to the best brains of our time.

We may have a man on the moon in five years and have round trip travel to other planets within the foreseeable future, but unfortunately (or otherwise) most of us are destined to live out our lives on planet Earth.

At a time when scientific and engineering brainpower is meeting successfully the problems of conquering space and reducing the costs of space conquests, geoscientists are experiencing many difficulties of conquering planet Earth—a task we have been wrestling with for years.

Inasmuch as most of us are on this earth to stay, it is disturbing that we have no systematic program for unlocking its mysteries and its resources to permit us a fuller life through the utilization of new knowledge about the earth and its total resources. Our geologic research, for example, including geologic mapping, is and has been for the most part hit or miss. Basic mineral research is almost non-existent, fundamental research in petroleum geology has left much to be desired. The applications of geology to the world of today and tomorrow are scarcely beyond the pilot-project stages.

The conquest of space has one big advantage in that it has developed rapidly and consequently has benefited from centralized, organized planning. There are operation plans, operation budgets, time tables, and defined objectives.

In the face of the space age dilemma, geoscientists might innoculate their efforts with a generous dose of G.E.O.—Gumption, Enthusiasm and Organization. The results could prove surprising.

OUR COVER

Company Row, Millvale, Pa. Photograph of a painting by artist Alan Thompson. *By courtesy of Mineral Industries Art Gallery, Pennsylvania State University.*

The AMERICAN GEOLOGICAL INSTITUTE is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

GEOTIMES is the news magazine of the geological sciences. It reports on current events in the earth sciences, public education and public relations efforts throughout the profession, as well as appropriate legislative and governmental issues. It announces scholarships, fellowships, publications and new developments. It provides a forum for discussion of timely professional problems, and affords a common bond between the many specialized groups within the earth sciences

100 Years of Oil Geology

Part two of two parts[1]

by PARKE A. DICKEY[2]

GEOPHYSICS

In the 1880's Baron von Eotvoes invented the torsion balance, which measures the horizontal component of the earth's gravitational field. His interests were primarily in geodesy, but he found that the structures of the Hungarian plain were clearly shown by this instrument. It was first used in oil prospecting in Czechoslovakia in 1915. In 1920 E. De Golyer, then with the Amerada Petroleum Co., ordered two torsion balances, and made an experimental survey of the Spindletop dome, which showed as a gravity maximum. In 1924 another gravity maximum was found, the Nash Dome, which was the first oil field in the U.S. discovered by geophysical methods. As a matter of fact, most of the Gulf Coast domes are gravity minima, and after this initial success the torsion balance was not very useful on the Gulf Coast, although it was extensively used in Indonesia and South America (5).

Many experiments on methods of determing the vertical component of gravity with pendulums were conducted by Eckhardt and others starting about 1926, first for Marland, and later for Gulf. A few prospects were found, but the great success of gravity methods came with the development of the first practical gravity meter by Truman of Humble in 1930. It was highly successful on the Gulf Coast in discovering salt domes. Many different principles can be used in gravity meter construction, and several companies quickly designed other types of meters. It has been one of the most useful geophysical instruments in the Tertiary basins of the world where there is a big contrast in density between the younger and older strata.

The dip needle was used by iron prospectors for many years before the oil industry refined it into the magnetometer. It was extensively used in the late 1920's, but was less easily interpreted than other geophysical methods, and it fell into disuse. During the war the Gulf in cooperation with the Bell Laboratories developed a new magnetometer method adaptable to recording from an airplane, for the purpose of detecting submerged submarines. After the war it became possible to cover enormous areas cheaply, and magnetic surveys are again being used in oil prospecting. The miners took back, streamlined and with wings, their old dip-meter which they had loaned the oil men and are using it to prospect for minerals.

Measurements of the velocity of artificial seismic waves were made as early as 1846. Both experimental and theoretical studies were actively pursued by physicists, so that the laws governing the propagation of acoustic waves in the earth were well known before the first world war. These were exploited during the war to locate enemy guns. When the war was over, L. Mintrop continued his experiments in Germany and applied for a patent on the use of refraction surveys to determine the character and depth of subsurface formations. In 1923 he organized the Seismos Gesellschaft and did work in Mexico and for the Marland in Texas. These were not very successful until the following year when L. P. Garrett of the Gulf employed a Seismos crew and suggested they use the fan pattern of shooting. De Golyer in 1925 founded the Geophysical Research Corporation which designed new equipment, entirely electrical, and much more sensitive than the mechanical seismographs used by the Germans. Other companies quickly picked up the method and more than forty salt domes were discovered in the next four years.

In the refraction method the shot and detector are placed a long distance apart, and the travel time of the first waves to arrive is recorded. These have often travelled along a deep high velocity bed and overtaken the slower-moving surface waves. In the reflection method the shot and detector are placed close together, and weak reflections from hard beds directly underneath the shot are detected.

The reflection method was suggested as early as 1914, and the Geological Engi-

[1] Part 1 appeared in GeoTimes, Vol. 3, No. 6, March 1959, beginning on page 6.

[2] Creole Petroleum Corp., Maracaibo, Venezuela.

neering Co. carried out experiments in Oklahoma as early as 1921. Before it could become practical greatly improved instrumentation was required. The strong low-frequency surface waves are filtered out, and then the weak reflections from below are amplified. Between 1927 and 1930 the reflection method was successfully used in the Seminole field of Oklahoma, where pools in the Wilcox sand are on domes, and the Viola limestone is a strong reflecting bed that can be easily mapped.

During the beginnings of geophysical prospecting in the 1920's much attention was given to electrical methods, because rocks vary widely in their electrical properties such as resistivity. Unfortunately eletrical currents and radio waves do not penetrate well and the effect of the deep beds is difficult to sparate from that of the near-surface formation. It occurred to Conrad and Marcel Schlumberger, working in France, to lower their electrode spread down a borehole. The shallow penetration was here no handicap, and the various kinds or rock showed remarkably different patterns. It was possible to make a strip log showing resistivity versus depth quickly and cheaply. Curious and still imperfectly understood electrical voltages also appeared on the instruments. Empirical correlations with the lithologies were possible. The method was used some in Europe, and the first large-scale routine used was in Venezuela starting in 1929 (24). The electric log is now the most important single tool of the subsurface geologist, and ranks with the seismograph as the most useful geophysical method. It has sometimes happened that too much reliance has been placed on it. It is still necessary to examine samples and to test sands mechanically for their fluid content.

As soon as geophysical methods proved successful it became obvious to foresighted geological leaders that research laboratories were necessary to service and improve the instruments. The most noteworthy in the early days were those of Humble, Amerada, and Marland. When the latter company merged with Continental, many of the laboratory staff were employed by Gulf which has since had one of the best. The Royal Dutch Shell group has always been very advanced technically and has operated laboratories in Holland and the U.S. for many years.

Reservoir Mechanics

The early geologists in Pennsylvania understood the effects of porosity and permeability and the role of gas and water in the production of oil. Slichter and King (25) made pioneer studies of the flow of fluids in porous media for the U.S. Geological Survey before 1900. However, the rise of the anticlinal theory turned the attention of geologists away from production problems, and the industry was more interested in finding new pools than in producing the old ones efficiently.

The injection of compressed air into oil sands to increase the flow was practiced before 1900 and Mark Mitchell of Franklin, Pa., took out a patent on the process in 1903. The method became common in the shallow depleted fields near Marietta, Ohio, about 1911. The introduction of water was generally feared by "practical" oil men and its admission to a sand was prohibited by law. Water-flooding began on a clandestine basis at Bradford about 1900, but it was not legalized until 1922. Pennsylvania operators supported research at Carnegie Tech where Fettke in 1926 measured the oil and water content of the sand, and at Penn State where Fancher and others showed that permeability and porosity were different, but both were specific properties of the sand. Muskat of Gulf (26) developed the theoretical basis for the flow of single fluids in sands. Botset, also of Gulf, was the first to explain the flow of two immiscible liquids, such as oil and gas, or oil and water. In 1940 he showed that the relative permeability of the rock to one fluid depends on the amount of that fluid present in the rock. When there is only a little, it will not flow.

The function of natural gas in the production of oil, and the concepts of reservoir energy were developed by H. C. Miller and others (28) of the U.S. Bureau of Mines in the 1920's. This work was followed up by T. V. Moore and others at the Humble laboratory in the 1930's. It led directly to the discovery of the fact that oil recovery is much more independent of well spacing than had previously been thought. One well to each 40 or 80 acres will usually recover the oil. This principle ranks with the anticlinal theory in saving the industry and public many billions of dollars in unnecessary wells.

Stratigraphic Prospecting

From 1859 to 1915 geologists were fully conscious of the effect of sand conditions in localizing oil pools, because most of the nation's oil was coming from pools of the stratigraphic type. The great success of the anticlinal theory caused the research for anticlines to become the objective of surface, subsurface, and geophysical meth-

(Continued on page 24)

MINERAL INDUSTRIES ART

by

JEANNE L. SLOBOD[1]

Unique in the United States today is the Art Gallery located in the Mineral Industries Building on The Pennsylvania State University campus. Built around the mineral industries theme, the 143 oil paintings, as well as several watercolors and prints, acquired by the College portray in a vivid cultural manner Pennsylvania's farflung mineral activities.

The gallery is probably the only one in the world devoted solely to mineral industries scenes and, as such, has won international recognition. This development of a theme is consistent with Penn State's unified program of bringing together within its College of Mineral Industries all the sciences and technologies that are concerned with the earth and the mineral raw materials it contains.

Of interest both to those working in the mineral industries field and to the layman, the paintings constitute an historical record of mineral activities in Pennsylvania, as well as bringing pleasure to the eye. One of the early acquisitions shows, for instance, the Diamond Colliery near Scranton, one of the oldest coal mines in the anthracite region; another shows one of the last bee-hive coke ovens to operate continuously while still another depicts a scene at the first oil well located at Titusville, Pennsylvania.

The paintings include scenes in both the bituminous and anthracite fields, views painted in the scorching heat of the steel mills, panoramas in Pennsylvania's oil fields; views of lime kilns, coke ovens, stone quarries, brick plants, glass works, and many other scenes of activities and objects. Virtually every section in Pennsylvania is represented. Many of the paintings are characterized by their vivid colors and bold imagery.

The varying conceptions of the different artists—ranging from detailed realistic presentations of industrial scenes to an abstract interpretation of a rock quarry—furnish a fascinating study.

The Mineral Industries Art Gallery had its beginnings over a quarter of a century ago largely through the efforts of Edward Steidle, now Dean Emeritus of the College of Mineral Industries. As part of his program to make the people of Pennsylvania more "mineral conscious," Dean Steidle began to interest artists in helping him accumulate a gallery of paintings devoted to the mineral producing and primary processing industries in Pennsylvania. Prior to that time very few artists were painting the industrial scenes so characteristic of the Commonwealth.

Today the Gallery boasts of an invaluable collection acquired through gifts, purchase, and loan. Housed in a gallery designated particularly for it, the collection overflows into adjoining conference and exhibit rooms, with many originals hanging in the departmental offices, and is constantly growing. The size of the collection makes it possible to rotate exhibits.

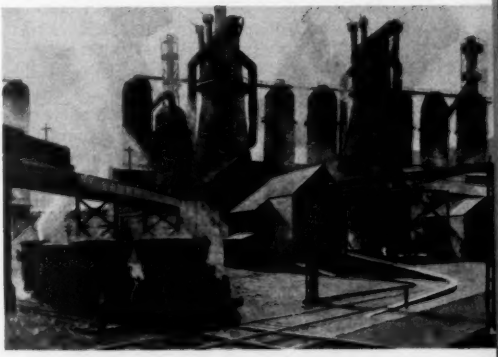
In conjunction with the Mineral Industries Museum with its exceptionally fine mineral collection and many mechanized exhibits, the Gallery has become one of the focal points in the region for visitors. In addition to the Penn State students who profit by having the Museum and Gallery as part of their daily fare, approximately 10,000 visitors annually are estimated to have visited it. The curator of the Gallery and Museum, David E. Snell, conducts tours for numerous groups during the course of the year.

[1] Jeanne L. Slobod, Editor, *Mineral Industries*, Mineral Industries Extension Services, The Pennsylvania State University, University Park, Pennsylvania.

ABOVE: "*Anthracite Breaker*" a painting by William Thomas Brown.

UPPER RIGHT: The Mineral Industries Art Gallery and Museum combines its fine collection of mineral industries art, mineral displays and other related mineral industries exhibits.

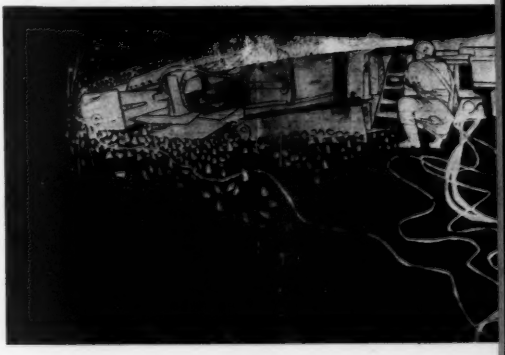
UPPER MIDDLE: "*The Quarry*" a painting by Floyd Gahman of the White Rock Quarry, Pleasant Gap, Pa.



LOWER MIDDLE: "*Big Steel*" by Howard L. Worner.

BOTTOM: "*At The Coal Face*" an original color woodcut by Antonio Frasconi.

All photographs by courtesy of the School of Mineral Industries, Pennsylvania State University.



GEOLOGY ON TV

C. Wroe Wolfe of Boston U. presented 15-week course

TV fans from Rhode Island to New Hampshire were able to tune in on Mother Earth via Boston's educational TV station WGBH as C. Wroe Wolfe of Boston University presented a 15 week course in Introductory Geology to a class in the studio from October, 1957 to February, 1958. Although the lecturer had presented 210 hours of geology over the same station's FM facilities in years past, this was the first attempt of the station to present a full course in geology via television.

According to Professor Wolfe, the staff of the studio was both cooperative and competent. No dry runs were required for the programs. No script was prepared for the half hour shows. Thus, the speaker and the staff worked together somewhat intuitively to produce a series on geology that proved very acceptable to a sizable TV audience. A list of materials, photos, or maps was made up prior to each show and was given to the producer to enable his camera men to cue in more readily.

The shows were entirely in black and white, but kodachromes projected in black and white showed up to considerable advantage as various features of erosion were discussed. Rock and mineral specimens were so magnified on the screen that details of structure could be more readily observed than in the usual classroom techniques. Porphyritic, granitoid, geissic, and other textures could be readily described and understood. Often the lecturer would casually speak to the control room or camera man to change the focus or the contrast in order to portray the particular phenomenon being described. Half tones, maps, and the old style 3x4 slides were very satisfactorily reproduced on the TV screen.

The most difficult problem faced by Professor Wolfe was the coordination of the television lectures with the lectures being presented to the adult class in the studio. The studio students were registered in an Adjunct in Arts degree program which is administered by the Commission on Extension Courses under the direction of Dean Reginald Phelps of Harvard for the Lowell Institute. The course in Introductory Geology involved fifteen two-hour meetings with an hour exam and a two-hour final exam. Less than 50 per cent of the students registered were actually seeking credit, however, and these individuals did not take the exams.

All walks of life were represented in the classroom. For most of them, geology was a source of interest in itself, and the credit was of no importance. Doctors, teachers, laborers, steam fitters, and others sat in the somewhat nonacademic environment of the studio to learn more concerning earth mysteries.

The lecturer was thus faced with the problem of presenting a course of collegiate caliber to these students during the first hour and a half of the evening, after which he had to shift emphasis and topic somewhat to give an attractive program over the air. The problem was finally resolved after the third meeting by choosing subjects for TV presentation which were not discussed on any other occasion. The visuals were strikingly available to the class on two studio monitors. Thus, the last half hour became a form of pictorial education for the class, while it became a total program for the TV audience.

This Earth of Ours by Professor Wolfe was used as a textbook in the classroom and was suggested for reading to the TV followers of the program. From various lines of evidence available, it seems that at least 50 books were purchased and used rather faithfully by the extra-studio students. Three of these students requested copies of the exams and sent them in for correction to test their comprehension. Their average grade was 82, while that of the class was about 78. Although the fan mail for the program was not extensive, the fifty odd letters were most enthusiastic, and both the studio staff and Dr. Wolfe were well pleased with the results.

The titles of the fifteen one-half hour programs are given below. From the scope of these subjects, according to the lecturer, it is clear that no more than an introduction

Petroleum Geochemistry Symposium

A symposium on petroleum geochemistry will be held at Fordham University, New York City, on Thursday evening, June 4, 1959, during the 5th World Petroleum Congress. The meeting will consist of an informal, open discussion of papers submitted by researchers who are active in this and related scientific fields. The papers will be preprinted and will be distributed upon request to all who wish to attend the meeting. These are some of the contributions to the program:

- *Synthesis of organic compounds in the atmosphere of the primitive earth,*
- *Reactions of Biochemicals during rock formation,*
- *Thermal alteration of chlorophyll,*
- *Bacterial activity in recent sediments,*
- *Petroleum genesis and accumulation mechanisms,*
- *The sedimentary strata as a chromatographic column,*
- *Nitrogen, noble gas and carbon isotype geochemistry,*
- *Recent U. S. and foreign developments in geochemical exploration for oil.*

The discussion moderator will be DR. G. D. HOBSON, Imperial College of Science and Technology, University of London, England.

Although the symposium is not an official part of the 5th World Petroleum Congress, Congress registrants may receive information and preprints at the document counter in the registration area in the New York Colliseum.

Inquiries should be addressed to PROFESSOR BARTHOLOMEW NAGY, *Department of Chemistry, Fordham University, New York 58, N. Y.*

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to the subject could be given, but the response was so enthusiastic that there can be no doubt that geology is one subject that is ideal for television presentation.

1. *Minerals: Mother Earth's Cookbook*
2. *Igneous Rocks: The Crust of the Earth*
3. *Rock Weathering: Little Rocks Out of Big Ones*
4. *Sedimentary Rocks: New Rocks from Old*
5. *Metamorphic Rocks: All is change*
6. *Running Water: Canyons in the Making*
7. *Ground Water: Caverns in the Making*
8. *Wind: Dunes and Dust*
9. *Glaciers: Mother Earth's Refrigerator*
10. *The Ocean*
11. *Earthquakes*
12. *Mountains and Their Origins*
13. *Origin of the Earth*
14. *Major Events in Earth History*
15. *The History of Life.*

THE UNDISCOVERED EARTH

A Conference to be held June 11-12 by Southern Research Institute Birmingham, Alabama

An interesting conference with the theme of "THE UNDISCOVERED EARTH" will be held in Birmingham, Alabama, on June 11-12, 1959, under sponsorship of Southern Research Institute. Focusing attention on the relatively small amount of knowledge possessed by man about his own planet, the conference program will include such topics as:

- The Earth As We Know It
- Mineral Treasure in the Sea
- Project Plowshare
- New Horizons Opened by the IGY
- Water for an Expanding World
- Energy Sources for the Next Fifty Years

The Keynote Address will be presented by Dr. A. B. Kinzel, Vice President, Union Carbide Corporation. Dr. Edward Teller, atomic scientist, will be the speaker on *Project Plowshare.* Dr. Gordon G. Lill, Head, Geophysics Branch, Office of Naval Research, will describe the *Deep Hole Project.* Dr. D. M. Davidson, President, E. J. Longyear Company, will speak on *Tapping the Earth.* Dr. Thomas B. Nolan, Director, U. S. Geological Survey, has the subject of *Technology and the National Minerals Problem.* M. King Hubbert, Shell Development Co., will discuss *Energy Sources* and R. M. Leggette, Consulting Geologist, will talk on the topic of *Water for an Expanding World.* Other outstanding men will cover the remaining topics.

Anyone interested in having more detailed information about the conference may write SOUTHERN RESEARCH INSTITUTE, *2000 Ninth Avenue South, Birmingham, Alabama.*

MANPOWER *in a column —*

By HOWARD A. MEYERHOFF
Scientific Manpower Commission
1507 M Street, N.W., Washington 5, D. C.

It's one thing to have an idea, but quite another to put it to work. That goes double for ideas that have political overtones, such as the one outlined in the January-February issue of *GeoTimes*. There it was reported that the Scientific and Engineering Manpower Commissions were proposing a national policy on technological manpower.

Act II, Scene 1, of this drama was enacted in Room 212 of the Senate Office Building on March 3. At that time representatives of the two Commissions appeared before the Senate Committee on the Armed Services to recommend that the Universal Military Training and Service Act be amended so as to permit the Selective Service System legally to assign scientists and engineers to employment in activities deemed essential to the national welfare and security. Thomas H. Chilton was spokesman for EMC, Howard A. Meyerhoff for SMC.

The Draft Acts of 1951 and 1955 empower the Selective Service System to induct men for military service. The Department of Defense is asking that the law be extended without modification for another four years. In the House of Representatives the department's request was granted unanimously in committee after perfunctory hearings. The Senate is more deliberate and more deliberative; hence it was here that the effort was made to have the law amended so that Selective Service may induct men not only for military service, but for other tasks in the national interest.

The members of the Senate Committee who heard the SMC-EMC proposals were sufficiently interested in them to waive the ten-minute limitation placed on witnesses. and at the conclusion of the 50-minute discussion, Drs. Chilton and Meyerhoff were asked to phrase appropriate amendments for further consideration when the committee goes into executive session.

All this is encouraging, but anything can still happen. The Senate Committee can accept, modify, or reject the proposals. If it accepts them with or without modification, the bill must then be passed by the Senate. If passed, the amended bill must then go back to the House, where the amendments may or may not prove acceptable. At no point in these successive steps can the scientific and engineering organizations offer further support for their proposals.

The process is somewhat like taking a single rocket shot at the moon. We can merely keep our fingers crossed and hope we were on target.

SINCLAIR FELLOWSHIP AT COLUMBIA U.

The Department of Geology, Columbia University, announces the Sinclair Fellowship amounting to $1,500 plus tuition allowance for the academic year 1959-1960. This fellowship, made possible by the Sinclair Research Laboratories, Inc., is open to students who wish to take graduate work in any branch of geology. Applicants should communicate with the CHAIRMAN, *Department of Geology, Columbia University, New York 27, New York.*

MONTANA FIELD TRIP

The Tenth Annual Field Conference of the Billings Geological Society will be held in the Sweetgrass Arch—Disturbed Belt area of northwestern Montana the second week of August 1959. Registration will be August 12 in Great Falls and a banquet will be held that night. The field conference will begin the morning of August 13 and will cover the geology of the country between Great Falls and Gibson Reservoir. The group will camp out that night at the reservoir. The day of August 14 will be spent studying the geology of the area between Gibson Reservoir and Helena and a banquet will be held in Helena that night. The morning of August 15 will be spent in the country between Helena and Townsend with the conclusion of the conference in the early afternoon near Townsend.

The purpose of the conference is to acquaint more people with the rock strata, mountain-front structure, and the oil and gas possibilities of the area between Great Falls and Townsend. It is hoped that talks at the banquets can be arranged to include local western history as well as geology.

For further details write DON W. BUELOW, RESERVATIONS COMMITTEE, *P. O. Box 1657, Billings, Montana.*

GeoScience Abstracts Features Map Coverage

In the first two issues of *GeoScience Abstracts* (Vol. 1, Nos. 1 & 2, January & February 1959) 86 geologic maps were cited in *Section 1 Geologic Maps, Areal and Regional Geology* (including Guidebooks).

Many of the map citations are accompanied by a brief abstract prepared for the most part by staff members of the issuing organization. Geologic maps constitute an invaluable segment of geologic literature and no coverage of geologic literature can be considered to be complete without inclusion of these maps. As *GeoScience Abstracts* develops, it is anticipated that there will be an increasing number of abstracts accompanying the map citations. Geologists engaged in exploration for petroleum and mineral resources will find this map coverage particularly valuable.

Geoscience Abstracts expects to concentrate on field trip guidebooks, since these also constitute an important segment of geologic literature often unrecorded in bibliographic listings. Local societies, state surveys, college departments, and other organizations are invited to submit abstracts of 200 words or less for guidebooks and maps published since January 1958. Unless the abstractor has prepared the reference to the paper being abstracted in conformity with *GeoScience Abstracts* specifications, the abstract should be accompanied by a copy of the guidebook in order that the reference may be properly cited by the editorial staff. The name of the abstractor should be given, so that he may be properly credited.

The first two issues of *GeoScience Abstracts* contained a total of 549 entries. The journal is organized in 15 subject sections and contains a monthly author index.

Abstracts of
GEOLOGIC MAPS AND GUIDEBOOKS
should be submitted to
GEOSCIENCE ABSTRACTS
American Geological Institute
2101 Constitution Ave., N.W.
Washington 25, D. C.

AGI GLOSSARY

Seeks voluntary aid from profession in revision

A revision of the Glossary of Geology and Related Sciences is in progress and the success of the project will depend greatly on the volunteer suggestions of the 11,000 users who have purchased copies of the first edition, published in 1956.

A supplement to the first edition of the Glossary is planned which will include new scientific terms, terms overlooked in the preparation of the first edition and corrections of some of the more critical errors found in the earlier volume. This supplement will be available in separate form to purchasers of the first edition and will be added at the back of subsequent printings of the first edition.

All new terms submitted for consideration in the supplement should be defined in full and should carry the exact reference to the publication in which the term first appears. Discussions of terms thought to be incorrect should be similarly documented in a specific manner.

Send your glossary suggestions to
Dr. J. Marvin Weller
Department of Geology
University of Chicago
Chicago 37, Illinois

Civil Service Announces Geologist Exam

The U. S. Geological Survey has announced an unassembled examination for geologists GS-9 ($6,285 per year) to GS-15 ($12,770).

Persons with two years of acceptable graduate training or an equivalent in acceptable experience will qualify for consideration at the GS-9 grade.

Persons desiring additional information should obtain Civil Service Announcement No. 184B issued February 17, 1959. No closing date is specified. Applications should be sent to EXECUTIVE SECRETARY, *Board of U. S. Civil Service Examiners, U. S. Geological Survey, Washington 25, D. C.*

GEOLOGY in the Public Eye

by Robert L. Bates

Professor Richmond E. Myers of Moravian College is continuing his series of articles on Pennsylvania geology, in the Bethlehem *Globe-Times*. Recent columns include a biographical sketch of F. A. Genth, mineralogist and chemist, contemporary of Dana, Penfield, and Silliman, who left a collection of 5,000 mineral specimens to Penn State; and the physiography of Cumberland County and its influence on early settlement and transportation routes through the Lebanon Valley. Myers' columns are written for the literate reader but are free of technologiwockle jargon. They've been running three times a week since 1955. We repeat a suggestion made in this space a couple of years ago: why not talk your local editor into running a column on home-area geology, by none other than yourself? . . . Last November the *Wall Street Journal* ran an editorial deploring the hammerheaded way in which some U.S. foreign aid and technical assistance is administered abroad. Later the paper published a letter by Russell Gibson, who wrote that as a consulting geologist he had found many of the reports true, but that on the other hand there are some honest, effective and dedicated technicians from this country doing a good job in foreign lands. "Among the most successful and modest," he added, "are geologists sent overseas by the U. S. Geological Survey." . . . There's a rattling good article in the February *Fortune* on geochemical prospecting. Availability of cheap, portable, accurate field-testing kits is stressed, and the paper-chromatography and colorimetry techniques are illustrated. Also included is the story of a promising lead-zinc find made in New Brunswick by four geologists using geochemistry. Recorded for all to see is this disgraceful fact: "Few mining companies spend anything at all on prospecting techniques." . . . T. B. Henderson of Junction, Texas, sends a copy of *Sir!* with an article about a fellow who went looking for tektites in southern India. Unfortunately he found no tektites, but in that remote province "his manhood was every girl's property." He had to content himself with merely "revitalizing the blood line" of the friendly natives. Foreign work, anyone?

FRENCH S.I.G. OFFER GEOLOGY REFERENCE SERVICE

• a report by Preston E. Cloud, Jr.

The publication monthly of some 3,000 to 5,000 technical papers dealing with the earth sciences poses a problem of major magnitude in documentation and classification. The *"Service d'Information Géologique"* (S.I.G.) of the *"Bureau de Récherches Géologiques, Géophysiques et Minières"* (B.R.G.G.M.) is attempting to cope with this problem by means of a classified card index, duplicated for sale to interested persons or institutions.

In the card index of the S.I.G., each reference is presented on a single 3 by 5 inch card, prepared under guidance of qualified technical personnel. Data given include author; date; original title if in Latin alphabet, or translation into French from Cyrillic or Arabic characters or ideograms; reference to publication; and index reference. The index provides ready reference by means of letters and numbers, to 1,200 subjects, the main headings being mineralogy, petrography, stratigraphy, tectonics, geophysics, general and dynamical geology, applied geology, history and activities of geology, regional geology, general paleontology, biology, botany, and zoology, prehistory, and problematica. Each card includes an average of 5 index references.

The cards are prepared as references, are received and issued to subscribers monthly, thus assuring maximum currency. The system employed incorporates the results of ten years of experience of the S.I.G. and its predecessor organization the *"Centre d'Etudes et de Documentation Paleontologique"* (C.E.D.P.) to produce an index applicable to the needs of all surveys, libraries, research institutes, and societies. With five sets of cards, it is possible to set up a card-index for authors and for detailed subjects. S.I.G. experience has shown the monthly classifying time to be very limited, and conversion to the use of these cards could cut down or eliminate need for expensive indexing of periodicals. The cards are intended for incorporation in any classifying system, including punch-card systems or electronic sorting.

All references carded are available in the library of the S.I.G. and microfilm or photocopies of them can be provided on order.

Offset-printed copies of this index, presently averaging about 25,000 cards a year,

appreciate

DATA SHEETS?

support GeoTimes!

AGI 11

SUPERPOSITION OF STRATA: PART 2

Paleontologic Criteria for Determining Top and Bottom of Beds

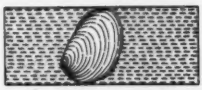
by

SIEMON WM. MULLER
STANFORD UNIVERSITY

Bryozoa. Shells of invertebrate organisms or other solid objects lying with their longer axes in the plane of stratification may be encrusted by bryozoans on the upper side.

Brachiopods. Crania-like brachiopods occur cemented on other shells or on substrate with their convex, conical valve pointing upward.

Pelecypods. a) Shells of **Schizothaerus** (Tertiary) and **Pholadomya** (Mesozoic) are not uncommonly found in their original buried position, "standing on end" with their posterior (siphonal) end pointing upward.

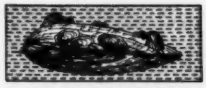


b) Rudists and rudist-like aberrant pelecypods are occasionally found in their original upright position with the free valve at the top.

c) Disjointed or spread-out open valves of **convex pelecypods** are generally brought to rest by wave action or by currents with their convex side up. Exceptions to this rule are not uncommon. Observations based on a single shell or only a few shells are not 100% reliable.

d) Inequivalved pelecypods if *buried alive* will have their more convex valve point downward.

e) Shells of marine organisms or other solid objects on the substrate may be *encrusted* on their *free, upper surface* with cemented forms such as oysters, barnacles, or other sessile organisms.



f) Holes in a hard substrate produced by *boring organisms* generally open upward. (This is also true of "fossil potholes.")

Gastropods. In vermetids and similar worm-gastropods the final feeding tube (as well as scars of early stages) generally points upward during the life of the animal.

are available at a subscription price of 30,000 francs (about $70.00) annually for the first subscription and 25,000 francs for additional ones. As this service is a nonprofit venture within a public establishment, any savings gained from increased subscription can be devoted to enlarging the coverage, which now includes 3,500 periodicals, of which more than 200 are in Russian.

In addition to the card index, S.I.G. is prepared to provide summaries, translations, etc., as announced in its quarterly report, *Bulletin Trimestriel du Service d'Information Géologique.*

Full information, descriptive data, and samples of work may be obtained by addressing MONSIEUR J. ROGER, *B.R.G.G.M., 74 rue de la Fédération, Paris 15e, France.*

Corals. **Solitary corals** cemented to the substrate are normally oriented with their narrow end down, widening (and branching) upward.

Colonial corals may be preserved in their original position with their calyxes pointing upward. Along the edges of coral reefs large "heads" or "mats" of corals may cling to the side or even the bottom of a protruding edge and have their calyxes point downward.

Colonial corals (and calcareous algae) of **biscuit** or **bun shape** normally grow and become buried with their convex side up.

Worm trails. Worm trails and trails of problematical organisms generally leave grooves on the face of the bed. Worms grubbing near the surface of the substrate will leave raised, flattened ridges with a barely perceptible groove in the middle, presumably due to the "caving" of the grubbing "tunnel" after the organism passed through the tunnel.

Echinoids. Sea urchins when found in large numbers are commonly oriented with flat ventral (oral) side down and convex dorsal side up.

Physical Criteria for Determining Top and Bottom of Beds

Lava flows. Tops of interbedded lava flows generally are more vesicular. In lavas which contain branching tubules the direction of branching is toward the bottom and the direction of junction is toward the original top of the lava flow.

A more or less perceptible contact metamorphism (brick-red burned soil) may be present in the rocks below the bottom of the lava flow, but no metamorphism and a depositional contact will mark the top of the lava flow.

Crests of wrinkles. The crests or tops of wrinkles on the surfaces of lava are generally smoother and more broadly curved than the spaces between the wrinkles.

Pillow lavas. In pillow lavas the following features indicate the top of the flow:

a) Upper surfaces of pillows are moderately or gently convex and relatively smooth.

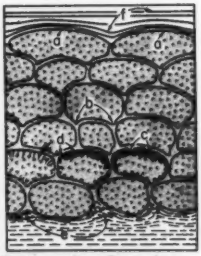
b) Bottoms of pillows commonly have cusps pointing down into the interspaces between the underlying pillows.

c) Pillows are generally more vesicular near the top than near the bottom.

d) Small scale columnar jointing may be more or less well developed around the upper periphery. Columnar jointing is poorly developed or is altogether absent on the bottom side of the pillow.

e) Pillows extruded upon unconsolidated sediments are likely to ruffle and crumple these underlying sediments and may have enough heat to bake these contorted sediments.

f) The top of the pillow lava flow generally shows no heat effect on the overlying sediments. The "pillowy" surface of the flow is gradually effaced or leveled by the overlying sediments which tend to fill the depressed area more rapidly.



This data sheet when cut out and punched will fit a handy pocket-size notebook available from almost any stationery store. There are many and varied data sheets available commercially in this size. If you have ideas for helpful data sheets write to Dr. R. M. Foose, Stanford Research Institute, Menlo Park, California. Chairman AGI Data Sheet Committee.

The Future of

GeoTimes Depends

On Contributions . . .

. . . YOUR CONTRIBUTIONS!!

COMMITTEE OF 1000 FOR AGI—1959

New committee tops 100 in enrollment

The Committee of 1000 for AGI in 1959 attained a membership of 121 with the addition of the 57 names listed below. Previous lists were published in the January-February issue (p. 22) and March issue (p. 17) of GeoTimes.

Members of the Committee of 1000 have contributed $10 or more to the support of GeoTimes and the program of the AGI. These contributions are proving a significant force in providing much-needed working funds to carry on the AGI program. Members of the Committee of 1000 have no obligation to contribute in future years, but it is hoped that such contributions will continue until a much-needed long-range stable finance program can be effected.

Funds from individual contributions are still substantially below the minimum objectives, so that the outlook for the continuation of GeoTimes and some aspects of the AGI program are not assured.

Your contribution to the Committee of 1000 or a smaller contribution, if that is what your budget will stand, will be a much-needed aid to GeoTimes and the AGI.

Recent Additions to the Committee of 1000 for AGI-1959

Oreste G. Alessio, Jr.
O. P. Ashurst
Charles E. Bass
John L. Baum
Kenneth G. Boling
O. L. Brace
W. A. Broughton
Andrew Brown
Carl F. Buchner
Charles D. Campbell
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John R. Crain
Donald H. Dahl
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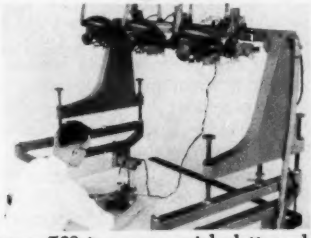
H. W. Thoms
G. E. Untermann
A. M. Wadsworth, Jr.
Warren R. Wagner
R. W. Watchous
Douglas Weatherston
Robert W. Webb
K. M. Willson
George M. Wilson

Pictured here are members of the geology staff of Montana State University under whom three doctoral candidates, aided by National Defense Education Act fellowships, will study. From left to right *(front row)* Professors F. S. Honkala *(Chairman)*, R. W. Fields, Ralph Yalkovsky, J. P. Wehrenberg, R. M. Weidman and John Hower. *(Back row)* Graduate Assistants, Ernie Anderson, Murli Manghnani, Larry Toler, Ronald Parker, and Orrin Pilkey.

Montana State University recently was awarded three doctoral fellowships in geology by the U. S. Commissioner of Education under the provisions of the National Defense Education Act of 1958.

The three $6,600 fellowships for graduate study toward the Ph.D. degree in geology at Montana State were the only awards in the area of geology made by the Department of Health, Education and Welfare in a field of 6,000 applications from 168 colleges and universities. In the selection program 160 fellowship awards for the year 1959-60 were awarded to 48 institutions in 36 states.

You saw it in GeoTimes . . .



BALPLEX 760 is a new aerial plotter which provides a 5X enlargement of the aerial photograph negative and is reported to be especially well suited for various types of mapping projects where large scale accuracy and detail are important. Write the *P. I. Bureau, Bausch & Lomb Optical Co., Rochester 2, N. Y.*

DR. MEYER RUBIN, geologist of the Geochemistry and Petrology Branch of the U. S. Geological Survey, was recently the recipient of an award given by the Washington Academy of Sciences in recognition of his pioneering investigations into Pleistocene chronology and rate studies of geologic processes, applying Carbon-14 methods. This was one of five awards made by the Washington Academy of Sciences on the occasion of the 60th Anniversary of its founding, to area scientists under 40 years of age "for outstanding scientific achievement."

RESEARCH EXPERIENCE FOR SCIENCE TEACHERS

A new NSF Program

On October 24 the National Science Foundation announced a new experimental education program to support a limited number of proposals from universities, colleges and other non-profit institutions with appropriate reseach facilities to provide a program of research participation for science teachers from small colleges and high schools during the summer of 1959. The purpose of this program is to provide for real research experience to persons who might not otherwise have the opportunity to work along with experienced research workers in the laboratory and field.

Proposals for 1959 participation from departments of geology and geophysics were few in number despite the excellent field research opportunities. Interested persons may wish to look ahead to the possibility of a geologically oriented research participation program in the summer of 1960, in which case their inquiry should be directed to *Special Projects in Science Education Section, Scientific Personnel and Education Division, Washington 25, D. C.*

TEKTITES IN GEORGIA

A report by
Virgil E. Barnes, Austin, Texas
and George A. Bruce, Atlanta, Georgia

Another North American tektite occurrence can be added to that listed in the article entitled TEKTITES (*GeoTimes, June, 1957*). As a result of publicity in the Eastman Times-Journal, Dodge County, Georgia, several leads developed which were checked in the field by the writers September 1 and 2, 1958, with the result that Georgia is proven to be an area of tektite occurrence. Barnes reported in 1940 that a tektite from Georgia was received by the U. S. National Museum in 1938, but until now this occurrence was not definitely confirmed.

Following the September field work a newspaper canvas was made of an additional 41 Georgia counties; as a result of this the Georgia Geological Survey has received a tektite from Irwin County about 50 miles from the original finds.

All Georgia tektites have been found in areas of Miocene rocks, whereas those in Texas occur on Eocene rocks. The Georgia tektites are transparent and very light green with an olive-gray cast, whereas the Texas ones are mostly nearly opaque in whole specimens and dark olive gray in plates cut from them. The Georgia tektites are more nearly like the Miocene ones from Czechoslovakia, yet there are differences. The Georgia tektites may, therefore, represent a completely new shower.

You saw it in GeoTimes . . .

ENGINEER TAX MEN . . . An Emerging Field for Engineers if the title of new brochure describing growing career opportunities for engineers in the field of taxation, including such areas of application as depletion, depreciation, etc. *Request Publication No. 5097, Assistant Commissioner, (Technical), Internal Revenue Service, Washington 25, D. C.*

You saw it in GeoTimes . . .

EASELBINDER is a friction type binder for charts, maps, etc. This looseleaf binder will accommodate up to a 1-inch thickness sheet materials in 3 sizes, 12"x36", 18"x 24", and 24"x36". For catalogue write *Plan Hold Corp., P. O. Box 1038, South Gate, California.*

International Geology Review

Published Monthly

INTERNATIONAL GEOLOGY REVIEW is published monthly by the American Geological Institute with the assistance of an initiating grant from the National Science Foundation.

The journal publishes in English full translations, condensations and reviews from foreign-language publications on significant developments in pure and applied geologic research. Particular attention is given to the literature of the U. S. S. R. Original papers of international significance are published in International Geology Review.

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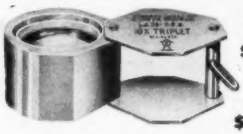

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Schedule of Field Trips

(Continued from page 1)

May 9—SAN JOAQUIN GEOL. SOC., field trip to study Miocene and older Tertiary on west side of San Joaquin Valley; write T. A. Roy, Box 193, Bakersfield, Calif.

May 9-10—MIDWEST FRIENDS OF PLEISTOCENE, field trip of Pleistocene & pre-Cary of west-central Wisconsin. Write: Black, Univ. of Wisconsin.

May 15-17—FIELD CONF. OF PENN. GEOL., field trip of glacial geology of Erie & Crawford co's. Write: Lytle at 300 Liberty St., Pittsburgh 22. Guidebook.

May 16—ILLINOIS STATE GEOL. SURV., trip to Wilmington area of Will, Kankakee & Grundy Counties, Illinois.

May 16-17—FRIENDS OF PLEISTOCENE GEOLOGY 22nd Meeting: Wisconsin stratigraphy between London and Lake Erie, Univ. of Western Ontario, London, Ont., Canada.

May 20-23—PANHANDLE GEOL. SOC., field trip of struct. & stratig. of NE New Mexico & Raton Basin. Write: Carver, Box 2473, Amarillo, Tex. Guidebook.

June 12-14—MICHIGAN BASIN GEOL. SOC., field trip to Mackinac Island, Mackinaw City area and Rogers City quarry.

Aug. 12-15—BILLINGS GEOL. SOC., field trip of Sweetwater arch & disturbed belt near Great Falls and Helena, Mont. Write: Busby, Box 1836, Billings. Guidebook.

Sept. 9-11—WYOMING GEOL. SOC., group field trips to Big Horn Basin, Wyo. Write: Leverett, Box 875, Thermopolis. Guidebook.

Sept. 10-12—ALBERTA SOC. OF PETR. GEOLOGISTS, 9th Field Conference. Technical session Sept. 10, trip to Moose Mountain Sept. 11, trip to Drumheller Sept. 12.

Sept. 10-12—UAPG: field trip and camp out in Wasatch-Uinta Mtns. area of Utah. Write: John Osmond, Box 34, Salt Lake City, Utah.

Sept. 12-13—FRIENDS OF THE PLEISTOCENE, Rocky Mtn. Sect., field trip to Wind River Mts., Pinedale, Wyo. Write: Richmond, Denver Federal Center.

Sept. 13—ILLINOIS STATE GEOL. SURV., field trip to Silurian of Whiteside and Carroll Co's., Ill.

Oct. 4—ILLINOIS STATE GEOL. SURV., field trip of Coal Measures of Clark and Edgar Co's.

Oct. 7-10—ROCKY MOUNTAIN ASSOC. GEOL., field trip of Cretaceous of western Colo., a Cretaceous symposium of Colo. Write: Kretz, 722 Patterson Bldg., Denver. Guidebook.

Oct. 15-17—NEW MEXICO GEOL. SOC., general geology of West Central New Mexico; write NMGS, Box 27, Socorro, N.M. Guidebook.

Oct. 18—ILLINOIS STATE GEOL. SURV., field trip of Coal Measures of Washington Co., Ill.

You saw it in GeoTimes . . .

A MANUAL OF MICROPALEONTOLOGICAL TECHNIQUES is being compiled by James D. McLean who requests that research workers submit previously unpublished successful methods or techniques for possible inclusion in this loose leaf booklet. *Write to McLean Paleontological Laboratory, P. O. Box 916, Alexandria, Virginia.*

Some aspects of geology—for instance, volcanoes erupting, or waves breaking on a rocky coast, or skindivers mapping the ocean floor—are best illustrated with motion pictures; but many other things can be shown better with the aid of still pictures which remain on the screen as long as the instructor lectures.

Each year many pictures and illustrations of outstanding merit appear in the literature. Similar material may go into company files, perhaps never to be seen again.

If the best of this, but only that portion for which copyright restrictions do not apply, could be assembled by subject, and 35 mm filmstrips of it prepared, teachers would have a ready source of up-to-date illustrative slide material. A guide probably should accompany each filmstrip to give source credit and explain each picture.

The assembly of truly superior illustrations would entail careful search through much source material, and would require considerable time. But successful completion of such a task would provide potent aids for the improvement of geologic teaching.

Is anyone interested in choosing a subject and tackling this?

FILMS OF INTEREST

COME AND FIND ME. 16 mm. Sound. Color. 24 minutes. 1957. A well-planned film picturing exploratory operations by an oil company. Animation depicts basin development and entrapment of hydrocarbons. Then comes leasing of the land, mapping by geological and geophysical crews, and drilling, coring and logging of the exploratory holes (producers, no less!). Relatively non-technical but carefully filmed. For all but the experts. DISTRIBUTOR: *Pure Oil Co., 35 E. Wacker Drive, Chicago 1, Illinois.*

MINING FOR NICKEL. 16 mm. Sound. Color. 43 minutes. 1955. After briefly describing some techniques used in the search for nickel ores, this film focuses on the Sudbury sulphide deposits, and with use of animation shows the methods (open pit, square set, cut and fill, shrinkage, blasthole, and caving) used to mine the ore. For those interested in economic and mining geology. DISTRIBUTOR: *Rothacker, Inc., 729 Seventh Ave., New York 19, N. Y.*

Radiocarbon Supplement

The *American Journal of Science* announces the establishment of a *Radiocarbon Supplement* to be devoted wholly or largely to publication of radiocarbon date lists from laboratories in various parts of the world. Professors Richard Foster Flint and Edward S. Deevey, Jr., are the editors.

Volume 1 of the *Supplement* will appear in May 1959. Thereafter, one volume will appear each year. The *Supplement* will be separate from the *American Journal of Science* and will be sent to a separate subscription list. The price of Volume 1 has been set at $2.50.

E. A. Olson and W. S. Broecker of the Lamont Geological Observatory have contributed the *Supplement's* first paper. It appeared in the January 1959 number of the *American Journal of Science* as an illustration of the *Supplement's* subject matter and will be reprinted in Volume 1 of the *Supplement.*

The office of the *Radiocarbon Supplement* is the same as that of the *American Journal of Science:* Box 1905A, Yale Station, New Haven, Connecticut, U.S.A.

DARWIN CENTENNIAL

observed at Univ. of Illinois

The 1959 spring semester has been designated at the University of Illinois as the "Darwin Centennial Semester" to commemorate the 100th anniversary of Darwin's *The Origin of Species* and its impact on culture. The following lecturers have been invited to participate:

PROFESSOR JOHN W. WELLS, Department of Geology, Cornell University. *"Geology, Darwin, and Biology."*

PROFESSOR BERT JAMES LOEWENBERG, Department of History, Sarah Lawrence College. *"Darwin, Darwinism, and History."*

PROFESSOR WILLIAM IRVINE, Department of English, Stanford University. *"The Influence of Darwin on Literature."*

PROFESSOR HANNES LAVEN, George A. Miller, Visiting Professor of Zoology, University of Illinois, and Geneticist, Max Planck Institute, Tubingen, Germany. *"Evolution in Mosquitoes."*

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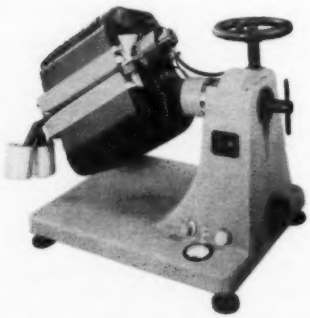

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INTRODUCTION TO GEOPHYSICS *by Benjamin F. Howell, Jr., McGraw-Hill, New York, 1959, 399 pp., $9.00.*

This book is a first—the first comprehensive text in English designed to treat solid-earth geophysics at the undergraduate level. As author Professor Howell, who is head of the department of Geophysics and Geochemistry at The Pennsylvania State University, states, this book might well have been called "Introduction to Plutology," since the subterrain is the area with which it is concerned. As such, it is a complete, beautifully written and illustrated compendium and comment on the present state of knowledge of the earth's interior.

Dr. Howell has performed a thoughtful, adroit job of dealing with not only the observations but the various theories dealing with the origin and status of our planet as we know it. The author, a competent geologist as well as geophysicist, has not neglected to use and coordinate geological data into his orderly scheme of things, nor has he neglected geophysical instrumentation and mathematics.

This lucid, valuable book is a must for the library of the geophysicist and geologist alike. While it does not deal directly with exploration, the fundamental data and ideas presented should be the background of all exploration. Before this book, the acquisition of such complete information by the student was a long tedious process seldom accomplished; Dr. Howell includes thirteen pages of references for those who wish to go further on any particular subject.

There are abundantly illustrated chapters on origins, temperature, isostasy, tectonic forces, geomagnetism, and terrestrial electricity. There are six chapters on earthquakes and seismology which are worth the price of the text. The recent tremendous advances in geochronology are developed in one chapter, and another chapter is an excellent treatise on mountain building. The twenty-four chapters in all are fascinating reading.

P.L.L.

BIBLIOGRAPHY AND INDEX ON URANIUM AND THORIUM AND RADIOACTIVE OCCURRENCES IN THE UNITED STATES, PART V, *compiled by Margaret Cooper, GSA Special Paper 67, 472 pp., Geological Society of America, 419 West 117th St., New York 27, N. Y., 1958, $6.75.*

Contains bibliographic references to occurrences in Connecticut, Delaware, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

PRICE LIST OF MAPS & PUBLICATIONS, *February 1959, Kentucky Geological Survey, 307 Mineral Industries Building, Lexington, Ky. Free on request.*

FIRST SUPPLEMENT TO BIBLIOGRAPHY ON MAINE GEOLOGY 1836-1957, *10 pp., 1959, Maine Geological Survey, Augusta, Maine, $0.10.*

Supplements 143 page 1836-1957 bibliography, listing 55 publications on Maine geology issued since that time.

BIBLIOGRAPHY OF ENGINEERING SEISMOLOGY, *2nd Ed., by E. P. Hollis, 144 p., 1958. Earthquake Engineering Research Inst., 465 California St., San Francisco 4, Calif. $4.50.*

Over 2,000 entries and cross references classified under four major headings; is a revision of the 1954 edition.

PUNCHED CARDS: *Their application to Science and Industry, Edited by R. S. Casey, J. W. Perry, M. W. Berry and Allen Kent, 2nd Edit. 1958, 697 pp., Reinhold Publishing Corp., 430 Park Ave., N.Y. 22, N.Y. $15.00*

A handbook by qualified experts which provides information on the application of both hand- and machine-sort cards in the storage and retrieval of information. Contains an annotated bibliography on the uses of punched cards.

INTRODUCTION TO MINING GEOLOGY, VOL. I, *Text pp. 710, Vol. II, Illustrations, pp. 368, by Bohuslav, Stoces, published in English 1954, reissued 1958, Pergamon Press, 122 E. 55th St., N.Y. 22, N.Y., 2 vols. $12.00*

An over-all treatment of mining, from exploration through mining methods, organization and administration by the prominent Dr. Stoces, Czechoslovakian mining authority, with the editorial aid of E. H. Wisser in the preparation of the English version.

Popular Geology in Print

by Mark W. Pangborn, Jr.

Among the new books celebrating the Centenary of the oil industry, one of the best is *Hildegarde Dolson's* THE GREAT OILDORADO (Random, 1959, $3.95). In this informal account of the Pennsylvania boom, 1859 to 1880, journalist Dolson pictures life in the camps, and relates the activities of some mighty fragrant characters; written in lively style and with great good humor. Veterans of the Pennsylvania rush went to California in the 1870's, and were among the founders of the Union Oil Co.; the ups and down of this great "independent" are enjoyably traced in THE BLACK BONANZA, by *Earl M. Welty* and *Frank J. Taylor* (McGraw-Hill, 2d ed., 1958, $5).

J. Stanley Clark's THE OIL CENTURY (U. of Oklahoma Press, 1958, $3.95) is a scholarly history of American oil; drilling and production, the rule of capture, waste and the rise of conservation techniques, and the problem of imports are topics stressed in this readable volume.

Those of us old enough to remember the scandals of the Harding regime and the subsequent trials will enjoy their retelling in *M. R. Werner's* TEAPOT DOME (Viking, 1959, $5); written in a clear, unemotional style which warrants a stronger fillip of indignation. Surely the last man to be mixed up in such doings would be *Isador Molk*, Lithuanian Talmud scholar and refugee, whose off-beat but appealing autobiography THE MAKING OF AN OIL MAN (Citadel, 1958, $3.75) relates his entry into the Mid-continent oil industry during the Depression, via the junk and pipe business.

A veritable oil encyclopedia is engineer *G. A. Purdy's* PETROLEUM, PREHISTORIC TO PETROCHEMICALS (McGraw-Hill, 1958, $15). Among subjects treated are the history of petroleum, its geology, chemistry, transportation, uses, by-products, and especially its refining; well illustrated and rather strongly Canadian.

DESERT ENTERPRISE, THE MIDDLE EAST OIL INDUSTRY IN ITS LOCAL ENVIRONMENT, by *David E. Finnie* (Harvard U. Press, 1958, $5), is a most interesting survey of the enormous problems involved in operating wells and refineries in a turbulent Arab world; well documented and largely based on first-hand observations.

One Hundred Years —*contd. from page 7*

ods. The whole industry, geologists and non-geologists alike, came to believe that unless it had a closing structural contour, a prospect was not worth drilling.

The foolishness of this limited view was forcibly pointed out to the profession by A. I. Levorsen in his presidential address to the A.P.P.G. in 1936 (29). He showed that in the U. S. almost all the closed structures within reach of the drill had been found. "Of the 22 largest oil pools in the U. S.," he said, "more than half of the production was obtained from pools in which the dominant trap-making element was a change from porosity to non-porosity. Not a single one of these pools of stratigraphic type would have been discovered by our present orthodox geological methods unless it happened that there was a local dome or anticline present within the area of the pool." Large reserves of oil still lay untested in sands down the flanks of known anticlines, below regional unconformities hidden by later sediments, and in wedge belts of porosity. Levorsen's address was immediately taken to heart by most thinking geologists. However, so deeply entrenched was the anticlinal theory that it was years before his ideas were widely accepted, and it has only been in the last 5 or 10 years that a prospect without structural closure was accepted for drilling by oil company management. This may have been because structure contours appear precise and quantitative while stratigraphic factors are often vague and "nebulous," and less easily predictable.

The trend towards greater use of sedimentary factors received impetus from W. C. Krumbeim who showed in 1939 (30) that complex sedimentary properties can be reduced to relatively simple numbers by means of mathematical statistics. These numbers can then be contoured and used to predict sand conditions in the same way that structure contours can be used to predict structure. After the war the American Petroleum Institute sponsored a study by the Scripps Institute of Oceanography of the recent sediments of the northern Gulf of Mexico. During the past few years several of the major oil companies have also conducted investigations of recent sediments and sedimentary processes. Since the days of Lyell it has been known that the present is the key to the past, but geologists often forget this and try to dream up hypotheses to explain what they see in the rocks. These studies of recent sediments have added greatly to our ability to interpret what we see in the rocks and well cuttings.

Origin and Migration of Oil

The geologists of Col. Drake's day, Silliman, Rogers, Lesley, and Carll, all believed that oil was the product of the animal or vegetable remains buried in the carbonaceous shales commonly found associated with the oil pools. They believed that it was transformed from them by some unknown chemical process, and migrated to the reservoirs where it is now found in some obscure manner. In spite of a hundred years of study, experiment, and speculation, we know hardly any more today than they did.

In the 1870's it was discovered that hydrocarbons could be synthesized from certain metallic carbides, and theories of an inorganic origin of oil were discussed by certain chemists. These ideas were never accepted by geologists, and when it was later found that oil contains substances which will rotate the plane of polarization of light, and also certain molecular structures called porphyrins which could only have been formed in living organisms, the chemists also abandoned them. Supported by the American Petroleum Institute, Parker D. Trask in 1926 undertook a study of recent marine sediments, and he later studied ancient sediments associated with oil pools (31). Although he failed to find measurable amounts of petroleum, he did show that nearly all important oilfields are associated with organic shales containing from ½ to 5 percent organic matter.

In 1942 the American Petroleum Institute undertook another project searching for the mechanics of the transformation of organic matter into petroleum. Distinguished chemists, physicists, and biologists at three universities worked for several years (32). They were unsuccessful in finding the chemical reactions although they did learn a great deal about various processes, especially the effect of anerobic bacteria on the sea bottom in forming a chemically reducing environment favorable to the preservation of the organic matter when it is buried.

During the past 10 years several major oil company laboratories, using analytical methods not available to Trask, have succeeded in finding petroleum-like hydrocarbons in both ancient (33) and recent (34) sediments. The quantities are very small, and neither the chemical origin of these hydrocarbons, nor the manner in which they are concentrated in oil pools is yet known.

The Future of Oil Geology

Prospecting for oil involves the drilling of 10 to 20 dry holes for each discovery. Many oil discoveries have been made as a result of random drilling. Nowadays few wells are located without geological advice, but discoveries are often made where the geology turns out differently from what was predicated. No one any longer questions the value of geologists to the industry, but this difficulty in predicting the location of oil pools indicates that oil geologists still have a long way to go. This fact is recognized by the major oil companies who, since the war, have all established geological research departments.

In the past petroleum geology made its most notable strides when it enlisted the help of other fields of science, especially physics. In the 1930's geophysical methods tremendously increased the effectiveness of wildcatting. In the 1940's the geophysicists sometimes felt that only structural considerations were important and that they could make recommendations independently from the geologists. During the past ten years geologists and geophysicists have been working together effectively on the new and challenging objective of determining stratigraphic factors by geophysical methods. In a somewhat similar manner the efficiency of oil recovery was improved by the contributions of physicists to the study of reservoirs. There is a certain tendency at present in this field also to underrate the importance of stratigraphic factors and to consider reservoirs as if they were ideal and mathematically predictable. Future progress will come when geologists and engineers work together to first ascertain the geological conditions and then take advantage of them in designing recovery processes.

It seems probable that the biggest future advances will be made with the aid of the chemists. The area of greatest ignorance in oil geology is in the field of origin and migration, and this is the place where a new discovery would do the most good. Even minor improvements in our understanding of these processes would enable us to use our information more effectively. The discovery of a new principle like the anticlinal theory would revolutionize the whole art of prospecting.

References

References have been listed at end of Part I appearing in GeoTimes, Vol. III, No. 6, p. 25, March 1959.

DEAR SIR:

I believe congratulations and a hearty vote of thanks are due Mark W. Pangborn, Jr., for his very excellent and timely article entitled *"Some Targets for Popular Writing on Geology."*

I am 14 and vitally interested in geology. I have long felt the need for some good books on mountain physiography, desert geology, and so forth. I have a few texts on physical geology and historical geology, but they touch on these subjects only briefly.

I, specifically, would like to see a good book on the fossils of Southern California.

I sincerely hope that this article has affected others as it has me, especially authors.

I would also like to take this opportunity to thank the staff of *"GeoTimes"* for the excellent magazine they turn out. I receive *GeoTimes* from my uncle and appreciate it very much.

Sincerely yours,

ROBERT M. PETERSON
Oxnard, California

DEAR SAM:

This textbook definition has drygulched me: *"Fossils are the remains of any recognizable organic structures preserved since prehistoric time."* My long-treasured "lucky" horse tooth goes to the man who shows me the way out.

As always,

DR. GRABENHORST

P.S. Should I send my old beverage cans to the Smithsonian?

DEAR EDITOR:

This is an attempt to "blow off" some steam, to-wit:

Reference: Science 129, 552-53, 2-27-1959.

Comments: Is not this "innocent" news item a rather "sad" commentary upon geology as a scientific discipline, a cultural science, and/or a science useful to modern society?

Are there not among all the AGI members some who can make *some* phases of geology understandable and fascinating to any reasonably competent teacher of science in secondary schools? Could not the teacher of biology, chemistry, and/or physics in high schools be given a background whereby appropriate geologic data and illustrative materials could be woven into the fabric of science presentation?

Among 56 directors of science programs listed for teacher-recipients of NSF grants, four only appear to be advisors on geology: two are chemists, one a biochemist, and one is a biologist (presumably). Where are the geologists?

Geology does not need to be a unit in the crowded curricula of high schools (although I would argue long for it). Yet, in this age of utter dependence upon geology, teachers of science in secondary schools should have enough understanding of geology to give their students an appreciation of its educational aspects and its indispensability in modern activities—perhaps, even in national security!

Sincerely,

ARTHUR BEVAN

DEAR EDITOR:

I read with interest the historical note in one of your last issues of 1958 concerning the preliminary steps that led up to the founding of the A.G.I. In it you paid a nice and well deserved tribute to Lincoln Thiesmeyer. I can contribute a tiny bit of information regarding his presence. He was the officially appointed representative of the Association of College Geology Teachers, now known as the Association of Geology Teachers.

As you know it is customary when a new organization is being considered that all interested parties or groups may attend or send representatives. Dr. Thiesmeyer was a former president of the A.G.T. and was available to attend the meeting. As president of the A.G.T. at that time it was my privilege to appoint him. As a piece of unrecorded history it has always been interesting to me to realize that although the official representative of the A.G.T. played a valuable part in establishing the A.G.T. it took the A.G.I. several years to recognize the A.G.T. as an official cooperative organization. The delay is forgotten now.

Very sincerely yours,

PERCIVAL ROBERTSON
Professor Emeritus,
The Principia College
Former President A.G.T.

ROCK CHIPS

by SANDSTONE SAM

FROM THE PENS OF STUDENTS . . .

Permeability—"That means that when it is once a rock, it is always a rock; it don't change."

Straticosis—"A disease suffered by regional geologists, 'bugmen' and the like."

Facies fauna—"is a fossil found in the excrement of another animal."

Physco-ceramics—"a course listed in a mineral industries catalogue for crackpots."

Gondwana Land—"is land that usually isn't useful for anything."

On mineral exploration—"In recent years the wandering donkey has been replaced by the trained geologist. The geologist may be more expensive than the donkey but he is far more dependable."

(SaS note: Well, we can hope he is.)

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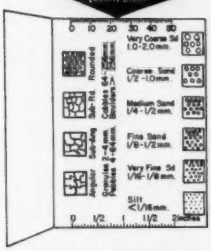
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MONTANA STATE UNIVERSITY, Missoula, Montana, plans to add two staff members in September, 1959. Must have Ph.D.'s; will teach average of 8 credits per quarter; research encouraged in this young, growing department. Must have backgrounds in invertebrate paleontology or mineral deposits. Will teach those courses plus some allied courses and/or beginning courses. Write Chairman, Geology Department.

DARTMOUTH COLLEGE, Hanover, N. H. Glacial geologist-geomorphologist for an opening in September, 1959. Ph.D. required. Preference to younger men. Salary and rank dependent on qualifications.

TEACHING POSITION requiring Master's or Ph.D. degree and ability to teach undergraduate courses in mineralogy, petrology, structural, and economic geology. Rank and salary dependent on qualifications. Prior experience desirable, but not essential. Write: R. E. Janssen, Chairman, Dept. of Geology, Marshall College, Huntington 1, W. Va.

APPLICATIONS are invited for the position on the staff of the Department of Geology in the rank of Assistant Professor on the salary scale $5400-100-7000 to teach paleontology and stratigraphy. Contribution by the University up to $750 made towards moving expenses. Curriculum Vitae, a recent photograph and the names of three referees should accompany the application to the President of Memorial University of Newfoundland, St. John's Newfoundland.

PHOTOGEOLOGIST with experience in geological mapping to work on various reconnaissance projects in the Northwest. Training and experience in economic geology essential. Opportunity to inaugurate and supervise section of newly reorganized department. Considerable travel during summer months. Salary open. Write D. W. Lindgren, Chief Mining Geologist, Northern Pacific Railway Company, Northern Pacific Bldg., St. Paul 1, Minnesota.

ANTARCTIC POSITIONS in traverse geophysics and glaciology for austral summers 1959-1960, 1960-1961, and austral winter 1960. Salary range: $6,000 to $10,000 plus isolation allowance, food, clothing. Applications considered through June 1959. Send education and experience resume to: U. S. Antarctic Research Program, Arctic Institute of North America, 1530 P Street, N.W., Washington 5, D. C. Attention: R. W. Mason.

CAPITAL UNIVERSITY, Columbus 9, Ohio. Teaching position beginning September 1959, full-time, undergraduate courses, especially mineralogy, economic geology, and related subjects, with some general geology-geography. Apply to Professor Ralph H. Bond, Department of Geology.

STRATIGRAPHER-PALEONTOLOGIST, Ph.D. To teach Historical, Paleontology, Stratigraphy, Structure, Field Methods. Prefer man with experience in Marine Geology for opportunities in research and teaching. Probably Assistant Professor rank. Submit qualifications to Agatin T. Abbott, Chairman, Department of Geology and Geophysics, University of Hawaii, Honolulu, Hawaii.

UNIVERSITY OF NEVADA, Reno, opening September 1959 for lecturer in paleontology, petroleum geology. One year appointment, with possible one year extension. Teaching load restricted to two courses per semester. Remainder of time collecting and curating fossils. For full details apply to: E. R. Larson, Chairman, Department of Geology.

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POSITIONS WANTED

BOX 398. WHO NEEDS A 29 year old, married exploration geologist with varied mineral deposit experience who can write? Has written articles and reports for all levels of geological interest and knowledge. Open to any attractive offer.

BOX 481. RESEARCH PETROLEUM GEOLOGIST-STRATIGRAPHER, 30, M.S. Extensive experience in most provinces U. S. and Canada. Have utilized newer exploration tools; Entropy Lithofacies mapping, Gamma-Halo surveys, porosity maps, moment maps, etc. Desire position of responsibility in research or exploration. Executive ability.

BOX 483. PETROLEUM-GEOLOGIST, M.S. 30. Diversified experience; subsurface, research, teaching. Knowledge of Texas, midcont., Rocky Mts., Appalachian, Canada. Creative thinker, aggressive, proven oil finder, capable of organizing or operating exploration or research group. Desire domestic or foreign position of responsibility.

BOX 536. GEOLOGIST, Ph.D., 30, family, desires teaching and research position in college or university, or research work with petroleum company. Principal fields micropaleontology and stratigraphy. Also proficient in sedimentology and petrography. Industrial and teaching experience.

BOX 547. GEOCHEMIST-MINERALOGIST, Ph.D., 34, married. Desires academic position, preferably one that combines teaching and research. Interested in crystal chemistry, phase rule, and synthetic mineralogy. Experienced in experimental geochemistry, microscopy, and x-ray diffraction. Publications.

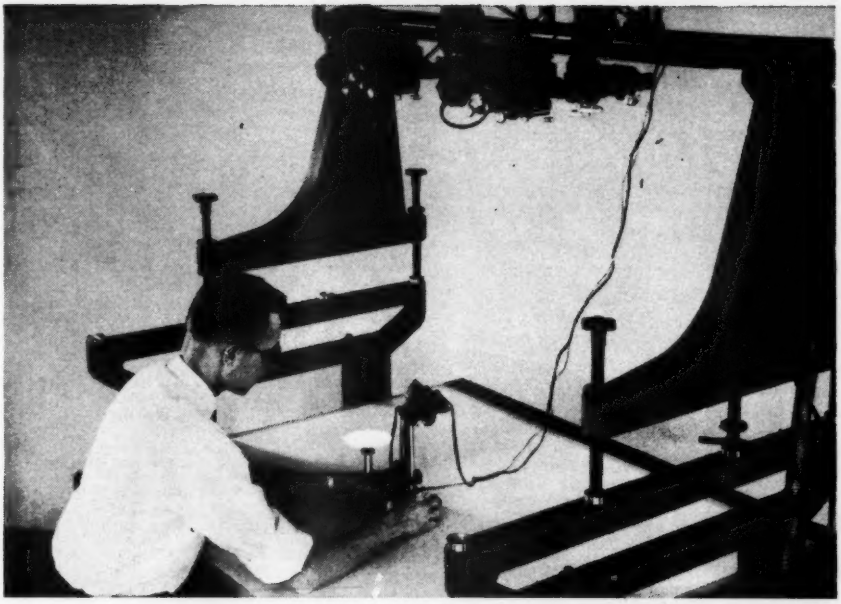
R. P. NODDEN, GEOLOGIST, 28 B.S. in June 1958. Single, veteran. Desires position where hard work will lead to advancement. Will work anywhere in U. S. or in foreign field. Box 457, Moncks Corner, South Carolina.

BOX 552. GEOLOGIST, Ph.D., 34, married. Desires permanent teaching position in small to moderate size school and town, preferably in south or west. Broad geological background in teaching and research, especially in sedimentary rocks, principles of stratigraphy, petroleum geology, and mineralogy. Presently employed as geologist by major oil company.

BOX 558. GEOLOGIST, B.S. in geology, 27, veteran, married, good academic training, heavy in geology, mathematics, and science. Some M.S. work. One year subsurface petroleum experience, minor mineral experience. Desires responsible petroleum, mineral, or academic position.

BOX 559. GEOLOGIST, M.Sc., 6 yrs. experience, West Texas, Venezuela and Libya; interested in electric log analysis and interpretation, facies studies. U. S. G. S. rating G-11, will travel; excellent references. Interested in petroleum industry and/or teaching.

BOX 562. PALEONTOLOGIST. Ph.D., 32, married, 4 years industrial and research experience, 4 years teaching experience. Specialities geochemistry and paleoecology. Some



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experience in oceanography. Desires teaching position with time for research starting September 1959.

Box 564. GEOLOGIST, 31, BS, family. Seven years experience in all phases mineral exploration, principally uranium. Desires challenging work and better chance for advancement. Written numerous reports and papers. Some supervisory experience in addition to research. Accustomed to dealing with the public. Domestic or foreign.

Box 566. GEOLOGIST, Ph.D., 40, family. Currently teaching with five years experience in mineralogy, petrology, economic geology, structural, and related courses. Wishes to relocate in teaching position.

Box 567. SURFICIAL GEOLOGIST, 28, single, M.S., soils-testing experience, seeks employment in New England.

Box 568. GEOLOGIST, B.A. 1956, Veteran, 25, married. Desires trainee position in any phase of Geology or allied field. Experience will be chief remuneration. No reasonable offer turned down. Foreign or domestic.

Box 569. ASS'T PROF., Ph.D., 43, family, 7 years of geological College and University teaching. Considerable varied field experience. Prefers teaching Stratigraphy, Structural Geology, General Geology and Mapping. Looking for better teaching position and location in area of more varied geology than where presently situated.

Box 570. GEOLOGIST, Ph.D., now teaching, desires summer stratigraphic work on Upper Cretaceous of Rocky Mountain region.

Box 571. GEOLOGIST, ASS'T PROF. in State University desires permanent research position in stratigraphy and allied studies with petroleum company.

Box 572. GEOLOGIST, M.A., 30, married, experienced in subsurface investigation with sound academic knowledge in Soil Mechanics, desires position as Engineering Geologist or Soils Engineer. Interested in all phases of engineering geology. Will work domestic or foreign.

Box 574. SEISMOLOGIST, Party Chief, Geophysicist. 6 years broad geographical experience, seeks more challenging position, better pay. Will consider foreign.

Box 575. GEOLOGIST, Ph.D., 31, family. Five years research-teaching experience. Desires permanent teaching appointment at school with at least moderate library and equipment facilities. Petrography-petrology, optical crystallography, mineralogy, structural and field geology. Some groundwater and sedimentary petrology. Publications. Available Sept. '59.

Box 576. GEOLOGIST, Ph.D., with several years experience in structure, stratigraphy and areal mapping. Desire teaching position in midwestern or western U.S.

Box 577. GEOPHYSICIST, B.S. in Geophysics. Five and one-half years diversified experience in seismic computing and interpretation. Desire responsible work in geophysical interpretation. Willing to work anywhere, including foreign. Presently employed.

BOX 578. PETROLOGIST-SEDIMENTOLOGIST, 34, Ph.D. from leading University. Broad experience in all phases of sedimentation, petrography, mineralogy-crystallography, stratigraphy and geochemistry, also petroleum and structural geology. Active research in quantitative interpretation. Seeks teaching position in University or College. Excellent references, teaching experience, research publications.

Box 579. GEOLOGIST, Ph.D., 29, family, desires teaching position in good University or College. Principal interests: Stratigraphy, Structure, Tectonics, Sedimentology.

Box 581. GEOLOGIST, M.S., May 1958, 27, married, veteran. Interest in all phases of Geology. Scant hydrogeochemical field survey experience. Presently engaged in missiles engineering work. Desire foreign or domestic position. Resume on request.

Box 582. GEOLOGIST, 37, B.Sc. Presently doing graduate work. Seven years experience domestic and foreign in Mineral Exploration and Mine resident work. Spanish. Available June. Excellent references.

Box 583. CONSULTING GEOPHYSICIST, B.S., 24 years experience in principal oil producing areas of United States. Specialist in seismic reflection interpretation. Outstanding record of successful oil and gas finding. Have concrete ideas concerning drilling prospects. Available on a full time basis or part-time retaining basis. Excellent health and references. Free to travel.

GEOLOGY MAJOR: Wants summer employment for experience. Will do anything. Phila. or Jersey shore preferably. W. Lohmann, Dickinson College, Carlisle, Pa.

Box 585. GEOLOGIST, experienced explorationist with diversified background in the Four Corners, Panhandle and Permian Basin. Previous work includes sub-surface, supervision and seismograph.

Box 586. GEOLOGIST, Ph.D., 35, married, background in Pleistocene geology, geomorphology, pedology, clay mineralogy, petroleum geology. Desires research and/or teaching.

Box 587. GEOLOGIST, Ph.D., 8 years experience in stratigraphy, structural geology, paleontology, regional geology, subsurface, well sitting, executive work, Rocky Mts., Midwest, Africa, with major and independent oil companies, seeks challenging position, domestic or foreign. Capable of organizing exploration group, and stratigraphical laboratory. Speak, read and write fluently French, German. Available immediately. Presently in Europe. Excellent references.

Box 588. STRATIGRAPHER-SEDIMENTOLOGIST-MICROPALEONTOLOGIST. Now teaching graduate and undergraduate level at Big Ten university, and completing Ph.D. Desires permanent connection college or laboratory. Present status temporary and in relief. Eighteen years petroleum geologist 11 of these in research, 4 as research supervisor. Two years teaching. Large publications list. Available Aug. 1959. Age well under 50.

Box 589. GEOLOGIST, B.S. with 8½ years experience in exploration and evaluation of varied mineral deposits. Experienced in planning and supervising all types of exploration programs. Good grasp of mineral economics. 32, family. Seeks position in mining industry or related field with challenge and interesting potential.

Box 590. GEOLOGIST, Ph.D., 37, family. Desires permanent teaching career. 6 years university teaching experience in Physical & Historical Geology, Economic Geology, and Geomorphology. Qualified to teach Structural Geology and Geophysics. 4 years in geophysics with a major oil company.

Box 591. GEOLOGIST-STRATIGRAPHER. M.S. Degree, 31, married, veteran, 2 years intensive training and experience in exploration with a major oil company in Canada. Secondary mineral survey experience. Wish to return to warmer climate. Available April.

Box 592. ECONOMIC AND STRUCTURAL GEOLOGIST, Ph.D., 32, family, with diversified survey, exploration, underground and teaching experience, desires permanent teaching post August 1959. Member Engineering Institute of Canada. Publications.

Box 593. GEOLOGIST, B.S., MINERALOGIST, M.S. in June. Desires position with mining company, oil company, or commercial laboratory. Any location. Resume sent on request.

Box 594. PALEONTOLOGIST - GEOLOGIST, M.S., 27, married. Two years experience in micropaleontology and stratigraphy. Desires foreign position. Resume on request.

Box 595. MINERALOGIST-GEOLOGIST, M.S. in May, married, 28, veteran with experience in electronics maintenance. Consider any offer. Available 1 June. Resume on request.

Box 596. MINERALOGIST-GEOLOGIST, Ph.D., 32, married. 8 years teaching experience in many fields of geology (also chemistry). Desires position combining teaching and research. Specialties: crystal chemistry, x-ray, and microscopy.

Box 597. ASSISTANT PROFESSOR, 32, Ph.D., married. 6½ years teaching experience at large eastern university; courses taught include undergraduate mineralogy and petrology, graduate metamorphic petrology and volcanology. Presently hold NSF fellowship. Interested in teaching similar courses at some western school; heavy teaching load no objection.

Box 598. GEOLOGIST, M.S., 3 yrs. seismic and 2 yrs. teaching experience. Desires a position with a major or an independent oil company. Available June 1959.

Box 599. MINING GEOLOGIST, B.S., Univ. of Mo., year of graduate study Univ. of Colo., 8 years extensive experience western U.S. and Africa in metallics, nuclear fuels, some nonmet., familiar with geochemical, geophysical, airborne exploration methods, project coordination, laboratory investigative procedures, mining methods. Special interest in geophysics. Directed geological departments of 3 private companies. Desire location or base of operations in U.S. Available immediately.

Box 600. GEOLOGIST, Ph.D., 34, Canadian, married, desires permanent teaching career. Background in precambrian, economic, structural, metamorphic and sedimentary geology. 3 years government survey; 5 years research geologist with leading Canadian mining-exploration company. Available September 1959.

B.S., 24, single, desires any position in the field of Geology, preferably with petroleum co. Walter F. Fox, Jr., 1617 Penn St., Zanesville, Ohio.

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